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The A.F.S.

As a member of long standing, we deplore the action of the American Foundrymen's Association in changing the name to American Foundrymen's Society. Long usage of the letters A.F.A. has engendered esteem, and almost affection, amongst foundrymen throughout the world. Its goodwill value stood remarkably high. Yet, in making the change, its members are only following an action taken by the British Foundrymen's Association some twenty-seven years ago. It can be assumed that perhaps in both countries there is a section of the population who imagine that an association is an employers' organisation. On the other hand, many people connect "society" with trade union activities. There are amongst the employee organisations some dozens of "societies," two of which—the United Metal Founders and the Iron and Steel and Metal Dressers—are within our own industry. Then there are the Poetry Society, the affairs of which at the moment are not too rhythmic, and, of course, the Royal Society, Britain's most highly esteemed scientific body. Still, the British Medical Association commands the esteem of the world! Thus what's in a name? The change took place on July 1. The old Association and the new Society has some 10,232 members on its roll, and so is the largest foundry technical organisation in the world. The Chicago Chapter has over 800 members, and therefore still heads the list numerically in regional organisations, with London running second. There are to-day 32 of these Chapters, which last year held 250 meetings. The annual conventions attract an attendance of 13,000 people. On a population basis the Institute of British Foundrymen compares quite well with the American Foundrymen's Society. Both have problems in housing their annual gatherings, and both share an enlightened policy of placing their findings freely for world consumption.

The histories of the British Foundrymen's Association and the American Foundrymen's Association are in many ways parallel, and co-operation was effected initially. It was strengthened with the passage of time. Since, in 1921, Mr. Elliot presented the first exchange Paper to the Blackpool conference, there have been about 75 such exchanges. These have materially enriched the technical literature on both sides of the Atlantic. Under its present enlightened direction the A.F.S. enters a new era with the assurance of success and with the best wishes of all other foundry technical associations.

An Explanation

Last week we used the phrase in a leading article that "research associations accepting Government grants-in-aid are, to our mind, being subjected to conditions of control which are intolerable." This has been very strongly objected to by those best qualified to know, and it seems our interpretation of intolerable was viewed with grave disfavour. This was because Research Associations, since their inception, have been treated with the utmost consideration by the Department of Scientific and Industrial Research. Our condemnation of Government control in such cases applies equally wherever public money is concerned, for the Ministries must safeguard the taxpayers and to do so they impose onerous legal conditions to cover themselves. It is abundantly clear, however, that these conditions have, in the past, been generously interpreted by the Department of Scientific and Industrial Research. The proposals of Dr. Bernals were, very naturally, a matter of deep concern to editors of the technical Press, and we feared that Research Associations would be next on the list for "revolutionising." This is obviously a period in our history when freedom of action must be safeguarded.

Contents

The A.F.S., 25.—An explanation, 25.—Nodular Cast Irons, Their Production and Properties, 27.—Production Planning for the Foundry, 35.—Obituary, 40.—Bank's Holding in Richard Thomas & Baldwins 40.—Chrome Ore and Concentrates Prices, 40.—Disastrous Effects of Bulk Purchasing, 40.—Boulton & Paul, Ltd., 40.—Personal, 41.—Rapier Walking Dragline, 41.—Ventilation Fan for South America, 41.—News in Brief, 42.—Shipyard Workers' Wages, 42.—Increases of Capital, 44.—Trafficking in Import Licences, 44.—Company News.

"Open House" at Ransomes & Rapier

Last Saturday the foundry and engineering works of Ransomes & Rapier, Limited, Ipswich, was open for visits from the relatives and friends of employees. A notable feature was the informality of the proceedings. Between two and three thousand visitors wandered at will through the shops, chaperoned only by the friend or relative who introduced them and who acted as guide. In addition to the ironfoundry, now producing Meehanite castings, this works comprises extensive machine and assembly shops for, amongst other items, large-size excavators, sluice gear and lift trucks. There is also a small non-ferrous foundry, a well-equipped patternshop and an apprentice training school.

Foundry Amenities

The foundry is a very airy shop which has recently been extensively modernised, particularly by the introduction of more light, by colour painting and other amenities. The walls have been smoothly plastered and painted in panels of cream washable rubber-base paint with spaced columns of blue. All the steel work has been treated and the general effect is very pleasing. That continuous effort is required to maintain this standard is well realised and routine arrangements include vacuum cleaning for walls, benches and steel work, and roof-glass washing. In process of development is a system of atomised water spraying for the intermittent laying of dust in the foundry. This promises to be very effective. Modernised facilities for taking drinking water and for washing are also provided. The new scheme for artificial lighting is mixed mercury discharge and tungsten filament systems arranged to give a minimum of 12 to 16 ft.-candles at any place in the foundry. From comments overheard on Saturday by our representative this "New Look" for the foundry was cause for much astonishment and approbation from older men who remembered how foundries used to be. The patternshop as well as the foundry was well patronised by visitors; in each department there were exhibited well-laid-out examples of work in progress.

Another section of great interest was the model river on which miniatures of the company's sluice gates, water controls, and measuring machinery were incorporated. Around the walls of this building were photographs of well-known irrigation systems where such equipment was used, and on benches were models of excavating machinery made by the company.

At various points in the factory, refreshments were available for the visitors, ice-cream for children being specially appreciated, and guides and executives were available to direct or explain if required. This is the second year in which an opportunity to bring their families has been given to the workpeople at Ransomes & Rapier's. Such a visit certainly brings a closer relationship between the family and the man's job and environment, and this factory is one which any employee could be proud to show.

Book Review

Analysis of Casting Defects. Published by the American Foundrymen's Association, 222, West Adams Street, Chicago. 6, Ill., U.S.A. Price on application.

Perfection in the reproduction of the photographs of the defective castings used as examples has been very nearly achieved in this book. This factor means so much in the intelligent interpretation of defects, that its importance cannot be over-emphasised. Yet the book would fail in its major purpose if it relied solely upon photography as the medium, but the inclusion of lists of causes does promote progress. Once a cause for a defect is established, the cure is in most cases relatively easy. This is a book for foundrymen, compiled by foundrymen. It is not meant for buyers of castings to assist them in assessing the nature of defects they may imagine to be present amongst any consignment. Such a use would only lead to endless disputes. The committee responsible for assembling the data must have had very logical, if not legally trained minds, for the reviewer has tried without success to find weaknesses in the statements. Thus his congratulations on the publication are as sincere as his admiration for the co-operation the committee has received from the editor and printers.

V. C. F.

Latest Foundry Statistics

There was in April a gratifying increase in the output of steel castings. The weekly average ran at 8,400 tons as against 7,600 in March and 6,800 tons in April, 1947. The labour situation in the ironfoundries, according to the Monthly Statistical Bulletin published by the British Iron and Steel Federation, shows a steady improvement. The returns for the week ending March 6 showed the total labour force to have grown during the month by 106 to 149,024, which involved a gain of 111 men and the loss of five women. The gain on the year is of the order of 15,000.

The Chemical Research Laboratory

Last week, this large group of laboratories at Teddington were thrown open to inspection by the Technical Press. The section of major interest to the foundry industry was the work being done on the corrosion of cast-iron pipe. When pipes are laid in damp clayey soil, where the conditions are anærobic (*i.e.*, oxygen excluded), replacement due to excessive corrosion may be a very heavy cost. Work at the laboratory has shown this corrosion is due to bacteria. Cures suggested are to coat the pipe with a thick layer of bitumen, preferably reinforced by micro asbestos, or to surround the pipe with gravel so as to allow oxygen to be present. Some nice work was also being done on the spectroscopic analysis of refractories.

Nodular Cast Irons, Their Production and Properties*

By H. Morrogh and J. W. Grant†

INTRODUCTION

It is well known that ordinary grey cast iron contains free carbon or graphite distributed through the metal in the form of flakes or lamellæ. These graphite flakes severely limit the mechanical properties of the material, rendering it relatively brittle and non-ductile. In malleable cast iron, the free carbon exists in the form of temper carbon nodules which consist of approximately spheroidal aggregates of graphite. Graphite in the form of nodules does not appear to exert such a deleterious influence as when the same amount of graphite occurs in the form of flakes. These facts are well known and have been illustrated and discussed in the literature upon innumerable occasions. Furthermore, it has always been obvious that if cast iron could ever be produced with the graphitic carbon in the nodular form, an improvement in mechanical properties should result.

In the past the achievement of this ideal nodular structure in as-cast grey irons has not appeared to be possible, since nodular graphite was only produced by the heat-treatment of white cast iron according to the conventional malleablising process. However, following a long-term investigation in the laboratories of the British Cast Iron Research Association, a process‡ has recently been developed by which grey cast iron can be obtained, having all or part of the graphitic carbon content in the form of nodules in the as-cast state without the necessity for applying a subsequent heat-treatment for the purpose of obtaining that structure. Irons produced by this process, and having this structure in the as-cast state, have been termed "nodular cast irons."

Morrogh and Williams[1,2] have given an account of the preliminary work leading up to the prediction of the possibility of producing nodular cast irons. More recently[3,4] the same investigators have given accounts of the development of the process and of some of the theoretical considerations underlying it. It is the purpose of the present Paper to give a detailed description of the mechanical properties of typical nodular irons and to discuss the commercial production of the material. Only a bare outline of the process will be given here, and for further details about the metallurgy of the process and the methods of investigation which have been used, attention is drawn to the other accounts, especially references[3] and[4]. For a full understanding of the process, consultation of these references will be necessary.

The Process for the Production of Nodular Cast Irons

Stated in its simplest form, the process involves the solution of an appropriate amount of cerium in molten cast iron of appropriate composition shortly before casting. The principal composition requirements for the iron to be treated with cerium are:—

(1) The iron must solidify grey even without the cerium addition.

(2) The iron must be of hyper-eutectic carbon content, that is, the carbon content should exceed the value

$$4.3 - \tfrac{1}{3} \text{ (Si per cent. + P per cent.)}$$

When the nickel content of an iron exceeds 10 per cent. it need not be hyper-eutectic according to this formula.

(3) The silicon content can have any value, but is preferably within the range 2.3 to 7 per cent.

(4) The sulphur content of the metal to be treated should be as low as possible and after treatment it should not exceed 0.02 per cent.

(5) The phosphorus content must not exceed about 0.6 per cent. and should preferably be below 0.1 per cent.

(6) Manganese, copper, nickel, chromium and molybdenum may be present in any amounts, singly or in any combination, provided condition No. 1 is observed.

The most important of the above requirements are those covering the carbon and sulphur contents. After treatment with cerium the solidified castings must contain more than 0.02 per cent. of this element.

The Influence of Cerium in Cast Iron

First and foremost, cerium combines with sulphur in cast iron and is a very effective de-sulphuriser. Cerium itself will not alloy with cast iron until the sulphur content of the material has been reduced below about 0.02 per cent. When cerium is added to molten cast iron containing sulphur in excess of this figure it immediately combines with the excess sulphur to give a cerium-sulphur compound which is relatively insoluble in molten cast iron and floats to the surface of the metal. This de-sulphurising reaction is very rapid; for instance, the sulphur content of 5 cwt. of molten metal may be reduced from 0.6 per cent. to below 0.02 per cent. in a few seconds by the addition of an appropriate amount of cerium. The process for the production of nodular cast iron depends firstly upon this de-sulphurising effect of cerium when the sulphur content of the iron to be treated exceeds about 0.015 per cent.

When more than sufficient cerium is added to the molten cast iron to reduce the sulphur content to below 0.02 per cent., or when the sulphur content is initially below this figure, the excess cerium dissolves in, and alloys with, the molten cast iron and then exerts a

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* Presented at the London Conference of the Institute of British Foundrymen, June, 1948.

†The Authors are on the staff of the British Cast Iron Research Association.

‡ This process has been made the subject of various British, British Commonwealth and foreign patent applications.

Nodular Cast Irons

pronounced carbide-stabilising effect, that is, it tends to cause the iron to solidify white rather than grey. It is important to note that the carbide stabilisation only arises from cerium actually dissolved in the metal and not from cerium combined with sulphur.

Function of Cerium in Producing Nodular Graphite Structures

When cerium is added to a molten hyper-eutectic cast iron of appropriate composition (as described previously), so that the final sulphur content is below 0.02 per cent. and the cerium content is in excess of 0.02 per cent., but below the amount which will give a white iron casting, on solidification it causes the hyper-eutectic graphite, which is deposited from the liquid before the metal proper begins to solidify, to crystallise in the form of nodules. When the metallic part of the cast iron solidifies, it does so as a white cast iron giving the familiar white iron eutectic containing cementite (iron carbide) so that immediately after solidification there exist nodules of hyper-eutectic graphite distributed through a white iron structure. Due partly to the inoculating effect of the hyper-eutectic graphite nodules, the cementite of the white iron begins to decompose shortly after solidification to give more graphite.

At this stage it is convenient to consider a typical example of the effect of cerium upon a hyper-eutectic cast iron. Fifty lb. of a hematite pig-iron of the following composition: T.C, 3.98; Si, 3.19; Mn, 0.78; S, 0.028; and P, 0.040 per cent. was melted in a crucible furnace and cast, at a temperature of 1,380 deg. C., into test-bars of four different sizes. A further similar melt was carried out, but in this case 28 gm. pure cerium was added to the molten metal before casting. The two sets of bars gave the following percentage composition:—

	Re-melted pig-iron.	Re-melted pig-iron with cerium addition.
Total carbon .. %	3.77	3.72
Silicon .. .. %	3.05	3.13
Manganese .. %	0.75	0.74
Sulphur .. %	0.023	0.007
Phosphorus .. %	0.039	0.038
Cerium .. .. %	—	0.040

The mechanical properties* of these two sets of bars are given in Table I.

The microstructures of all the untreated bars showed mixtures of undercooled and normal flake graphite in matrices of ferrite with some pearlite and the mechanical properties for this material, as shown in Table I, are at a relatively low level, as would be expected. On the other hand, the mechanical properties of the bars cast from the treated material are at a very much higher level and immediately fall into the range of properties covered by high-duty cast irons. The microstructure of the treated 1.2-in. bar is shown in Fig. 1. The hyper-eutectic nodules can be clearly seen, together with a form of graphite somewhat resembling flake graphite in a matrix of ferrite with some pearlite. The " flake-form " of graphite is that resulting from the decomposition of the eutectic carbide

* Unless it be otherwise stated, the transverse, deflection and tensile figures given in this paper for 2.1, 1.6, 1.2, 0.875 and 0.6 in. diameter bars were obtained on bars cast and tested according to British Standard Specification 786/1938. The impact figures were obtained on bars tested according to British Standard Specification 1349/1947. Details of the dimensions of fatigue, damping and torsion test pieces are given in the appropriate sections.

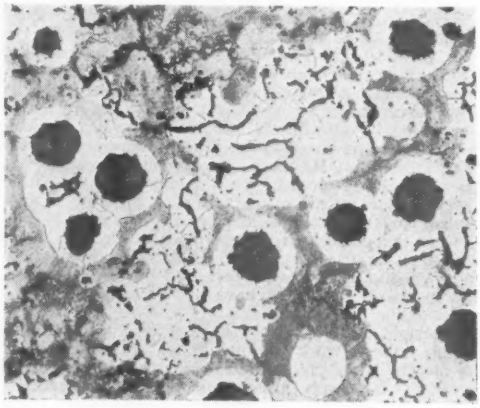


FIG. 1.—GENERAL STRUCTURE OF CERIUM-TREATED HYPER-EUTECTIC CAST IRON. ETCHED IN PICRIC ACID. 100 ×.

TABLE I.—*Influence of Cerium on Remelted Hematite Pig-iron.*

Diam. of test bars. In.	Transverse rup. stress. Tons per sq. in.		Deflection. In.		Tensile strength. Tons per sq. in.		Brinell hardness number.		Impact. Ft.-lb.	
	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.	Without Ce.	With Ce.
1.6	23.0	44.2	0.20	0.32	11.2	24.2	154	186	—	—
1.2	28.8	45.3	0.28	0.38	14.3	24.6	160	198	—	—
0.875	30.7	47.1	0.18	0.23	16.6	26.6	162	199	12	43
0.6	30.8	57.4	0.11	0.22	18.6	29.5	198	239	—	—

TABLE II.—*Influence of Double Treatment. Ce + Inoculant.*

No.	T.C.	Si.	Mn.	S.	P.	Ce.	Transverse rup. stress. Tons/sq. in.	Deflection. in.	Tensile strength. Tons/sq. in.	B.H.N.	Impact, ft.-lb.
1	3.67	2.67	0.86	0.005	0.051	0.040	56.9	0.60	26.0	221	54
2	3.49	2.89	0.88	0.008	0.055	0.058	62.0	0.60	33.4	238	84

after solidification and to distinguish it from normal flake graphite it has been termed " quasi-flake " graphite. This term will be used throughout the Paper to describe this form of graphite.

If Fig. 1 be examined closely, it will be observed that around each hyper-eutectic nodule there exists a volume of metal which does not contain any quasi-flake graphite. This is due to the fact that the graphite arising from the decomposition of the cementite immediately surrounding each hyper-eutectic nodule is deposited upon the nodule instead of giving quasi-flake graphite. This is made particularly clear when one of these nodules is examined at a high magnification—the inner nucleus of hyper-eutectic graphite surrounded by a distinct periphery of graphite deposited on it can be clearly seen. A typical instance of this is shown in Fig. 2 where a hyper-eutectic nodule in a cerium-treated hyper-eutectic iron is illustrated at a high magnification.

FIG. 2.—DUPLEX STRUCTURE OF HYPER-EUTECTIC NODULE. UNETCHED. 1,500 ×.

Irons of the type illustrated in Fig. 1 produced only by the simple addition of cerium, in some form or other, to the molten metal before casting, will usually have a microstructure consisting of a mixture of hyper-eutectic nodules, together with quasi-flake graphite. This process will be referred to as the " single treatment " process to distinguish it from a further elaboration of the process by which entirely nodular structures can be produced. As has been illustrated and described previously,[3,4] the form and shape of the quasi-flake graphite can vary considerably according to the amount of cerium present. With relatively low cerium contents the quasi-flake graphite is definitely in a flake-like form, but with relatively high cerium contents it tends to assume a nodular appearance, conferring a corresponding improvement in mechanical properties upon the resulting cast iron. Except in relatively heavy sections, it is not possible to utilise the latter effect of cerium, because of its pronounced carbide stabilising influence, which may cause the iron to remain white. For instance, if the cerium content of a ½-in. section, having a composition falling within the following range: T.C, 3.5 to 4.0; Si, 2.3 to 3.0; Mn, 0.5 to 1.5; S, 0.005 to 0.02; and P, 0.01 to 0.10 per cent., exceeds about 0.07 per cent., there is a serious danger that a white iron will result. It is obvious, therefore, that for the development of entirely nodular structures the process must be modified in some way to overcome this difficulty. This modification has been achieved by the introduction of what will be known as the " double treatment " process, which involves the addition of a graphitising inoculant to the molten metal simultaneously with, or immediately after, the cerium addition. By this double treatment process it is possible to obtain entirely nodular structures with the development of a new high level of mechanical properties.

To understand the double treatment process it is necessary to refer once again to Figs. 1 and 2. It will be

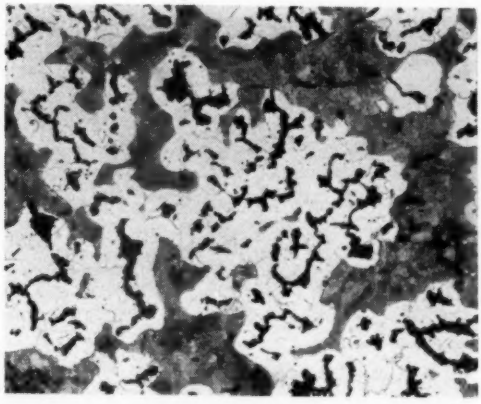


FIG. 3.—QUASI-FLAKE GRAPHITE IN SINGLE-TREATED NODULAR IRON. ETCHED IN PICRIC ACID 100 ×.

Nodular Cast Irons

recalled that each hyper-eutectic nodule is surrounded by a volume of metal containing no quasi-flake graphite, and that the graphite from this region has been deposited upon the already existing hyper-eutectic nodule. It appears that each hyper-eutectic nodule has a sphere of influence within which further graphitisation takes place by deposition on the hyper-eutectic nodule and outside which quasi-flake graphite forms. It follows, therefore, that if the number of hyper-eutectic nodules or nuclei could be increased so that their spheres of influence overlap, all the graphite will occur in the nodular form. That this is so has been proved[3,4] by the centrifugal casting of cerium-treated hyper-eutectic irons which, due to the low relative density of graphite and the action of the centrifugal force, causes a segregation of hyper-eutectic graphite nodules at the inner surface of the casting. The addition of the graphitising inoculant in the double treatment process has the effect of increasing the

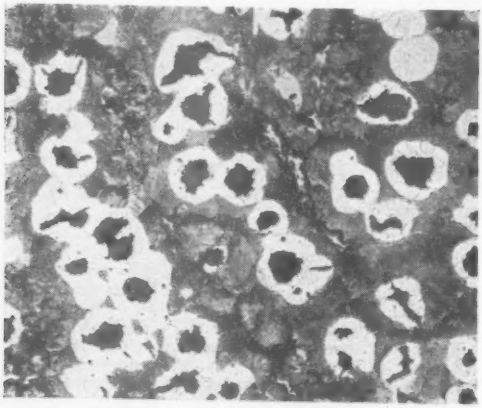


FIG. 4.—NODULAR STRUCTURE IN DOUBLE-TREATED NODULAR IRON. ETCHED IN PICRIC ACID. 100 ×.

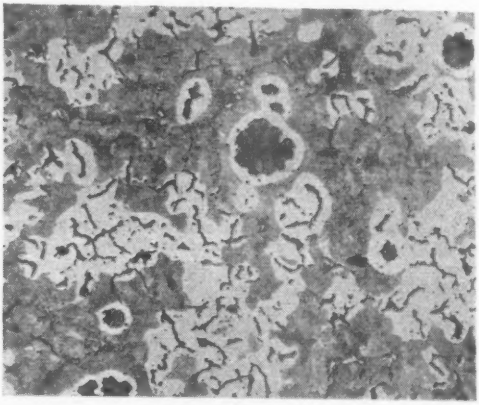


FIG. 6.—GENERAL STRUCTURE OF 1.2-IN. BAR, V.980. ETCHED IN PICRIC ACID. 100 ×.

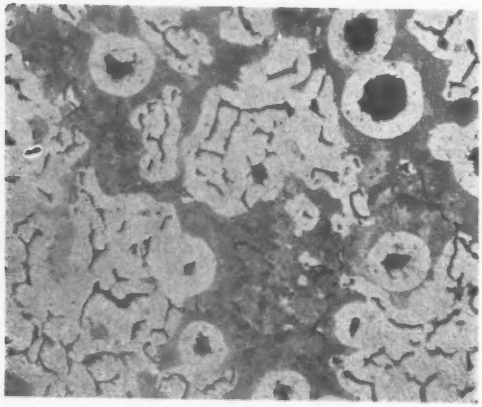


FIG. 5.—GENERAL STRUCTURE OF 1.2-IN. BAR, V.835. ETCHED IN PICRIC ACID. 100 ×.

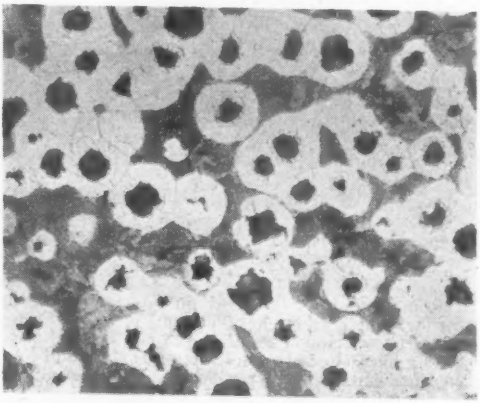


FIG. 7.—GENERAL STRUCTURE OF 1.6-IN. BAR, V.895. ETCHED IN PICRIC ACID.. 100 ×.

number of hyper-eutectic nodules. Suitable graphitising inoculants for this purpose are the 80 per cent. grade of ferro-silicon, S.M.Z.* or calcium silicide, but the first two are to be preferred to the latter.

Table II gives the analysis and mechanical properties of the two nodular cast irons cast in the form of 1.2 in. bars in greensand—No. 1 produced by the single treatment process and No. 2 by the double treatment process. In both cases the melt was treated with 0.14 per cent. cerium, but in the case of the double-treated iron 0.2 per cent. silicon was added as 80 per cent. ferro-silicon before casting.

The quasi-flake graphite structure of the single-treated bar No. 1 is shown in Fig. 3, and the almost entirely nodular structure of bar No. 2 in Fig. 4. The improvement in mechanical properties arising from the double treatment is clearly shown by the transverse,

* S.M.Z. is a proprietary silicon-manganese-zirconium alloy containing approximately 63 per cent. silicon, 6 per cent. manganese, 6 per cent. zirconium, and 20 per cent. iron.

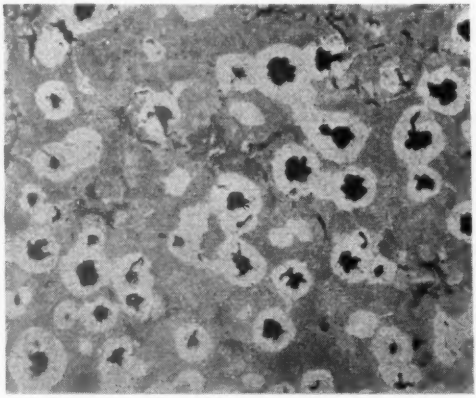


FIG. 8.—GENERAL STRUCTURE OF 1.2-IN. BAR, V.895. ETCHED IN PICRIC ACID. 100 ×.

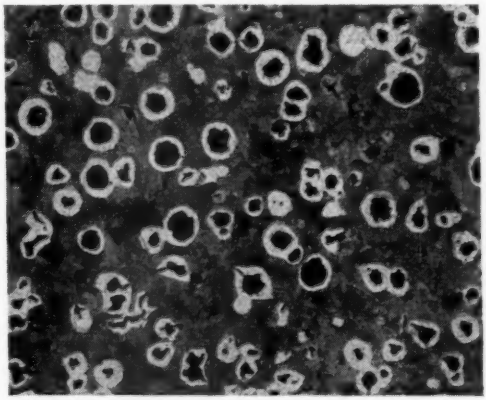


FIG. 10.—GENERAL STRUCTURE OF 0.6-IN. BAR, V.895. ETCHED IN PICRIC ACID. 100 ×.

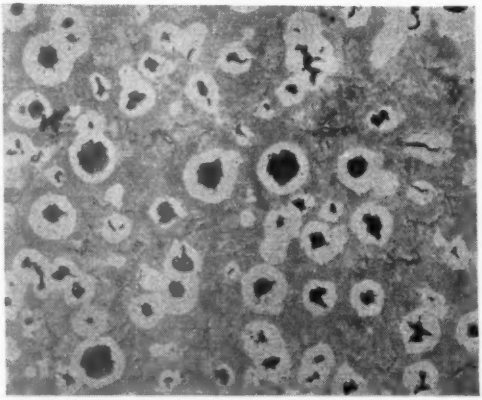


FIG. 9.—GENERAL STRUCTURE OF 0.875-IN. BAR, V.895. ETCHED IN PICRIC ACID. 100 ×.

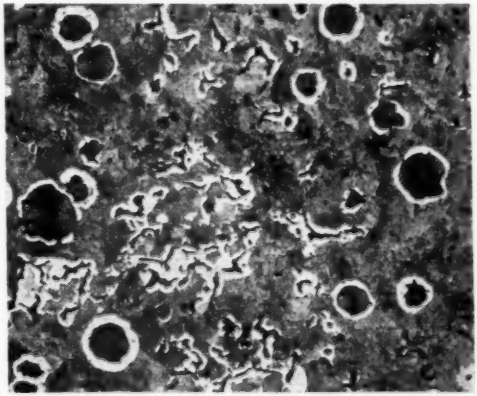


FIG. 11.—GENERAL STRUCTURE OF 1.2-IN. BAR, W.3. ETCHED IN PICRIC ACID. 100 ×.

tensile and impact figures given in Table II. These are more or less typical figures, although much higher figures have been obtained, for instance for impact strength, and many other examples have already been given in the literature.[3,4]

Method of Adding Cerium to Cast Iron.—Cerium is a pyrophoric metal well known as an important constituent in lighter flints. The pure metal can be added to molten cast iron, in which it will dissolve easily and quickly without any violent reaction, provided it is not allowed to float on the surface, under which condition some loss by oxidation may result. Pure cerium metal is, however, a very expensive material, and it is more convenient and cheaper to add the element in the form of "*mischmetall*," which is commercially available. *Mischmetall* usually contains 45 to 55 per cent. cerium, the balance being largely a mixture of the other rare earth elements which, for the purpose of the production of nodular irons, may be ignored. *Mischmetall* also dissolves easily in cast iron, and in all the remaining cases given in this Paper it has been used as the cerium addition.

Mechanical Properties of Nodular Cast Irons

Having now described very briefly the essential features for the process for the production of nodular cast irons, it is possible to make a detailed survey of the mechanical properties of typical examples of the material. Nodular cast irons must be regarded as new materials having mechanical and physical properties differing in many ways from those of high-duty grey cast irons on the one hand, and malleable cast irons on the other. In spite of the nodular graphite structure, nodular irons are still relatively brittle and non-ductile materials, and whilst, for instance, they have a shock-resistance inferior to that of the best grades of malleable iron, they are much less brittle than grey irons containing the usual flake graphite structures. The development and application of a new material of this type entails the determination of a wide range of mechanical properties other than those usually reported, such as transverse rupture stress, tensile strength, hardness, etc. The designer is interested, for instance, in the fatigue, damping and elastic properties of the material and, whilst the metallurgical aspects of the process have been dealt with in some detail already[3,4] in the literature, no attempt has yet been made to present a detailed survey of the special mechanical properties. An attempt to do this will be made in this section of this Paper, but it is realised that the results given represent only a very rough preliminary outline of all the information required.

The test-bars used for the determination of most of the properties reported in this section were cast from five oil-fired crucible furnace melts. In two cases single-treatment material, and in the remaining three cases double-treated material, was cast. For the cerium addition, *mischmetall* was used in each case and S.M.Z. alloy was used as the graphitising inoculant in the case of the double-treated material. For these melts three sand-cast pig-irons were used, of the following percentage compositions:

	Pig Iron A.	Pig Iron B.	Pig Iron C.
T.C	3.94	4.05	3.99
Si	2.78	2.58	1.95
Mn	0.57	0.96	0.88
S	0.017	0.011	0.028
P	0.029	0.038	0.048
Ti	—	0.08	0.12
V	—	0.01	0.02
Cr	—	0.02	0.02

A number of 1.6, 1.2, 0.875, and 0.6-in. diameter bars, and a number of special torsion bars, were cast from each melt. The standard transverse bars were all cast in greensand and top run.

The key to the numbering of the melts, the pig-irons used, the additions used, and the chemical analyses are given in Table III. The first material, V.835, was white in the 0.875-in. and 0.6-in. bars, and the second, V.980, with a smaller *mischmetall* addition, was white only in the 0.6-in. diameter bar. Both of these melts were single-treated and had micro-structures

TABLE III.—*Key to Melt Numbers, Raw Materials and Chemical Composition.*

Melt No.	Treatment and additions.	Chemical Composition.							Remarks.
		T.C, per cent.	Si, per cent.	Mn, per cent.	S, per cent.	P, per cent.	Ce, per cent.	Cu, per cent.	
V.835 Pig A	Single. 70 gm. *mischmetall* to 65 lb. tap	3.74	2.65	0.53	0.006	0.024	0.053	—	White in 0.875 in. and 0.6 in. bars.
V.980 Pig B	Single. 35 gm. *mischmetall* to 70 lb. tap	3.76	2.48	0.85	0.012	0.051	0.029	—	White in 0.6 in. bars.
V.895 Pig B	Double. 70 gm. *mischmetall* to 65 lb. tap. 6½ oz. S.M.Z.	3.55	3.01	0.80	0.004	0.044	0.053	—	
W.3 Pig C	Double. 90 gm. *mischmetall* to 70 lb. tap. 10 oz. S.M.Z.	3.60	2.33	0.84	0.011	0.044	0.045	2.19	
W.30 Pig C	Double. 110 gm. *mischmetall* to 70 lb. tap. 10 oz. S.M.Z.	3.68	2.34	0.77	0.009	0.035	0.054	1.49	

TABLE IV.—*Mechanical Test Results on Five Samples of Nodular Cast Irons.*

Melt No.	Diam. As-cast. in.	Transverse as-cast. Trans. rup. stress, Tons/sq. in.	Transverse as-cast. Deflection. In.	Transverse as-cast. Mod. of elasticity, × 10⁶, lb./sq. in.	Transverse machined. Trans. rup. stress. Tons/sq. in.	Transverse machined. Deflection. In.	Transverse machined. Mod. of elasticity, × 10⁶, lb./sq in.	Tensile. Ult. tensile stress, Tons/sq. in.	Tensile. Mod. of elasticity, × 10⁶, lb./sq. in.	Ratio. Trans. / Tens.	B.H.N.	Impact, 0.798 in. diam., ft.-lb.	Compression. Ult. compression stress, T./sq. in.	Compression. Mod. of elasticity, × 10⁶, lb./sq. in.
V.835	1.6	40.7	0.34	18.2	45.0	0.43	18.9	23.0	19.4	1.8	178	48 51	54.4	
	1.2	48.6	0.54	20.5	47.1	0.57	20.0	25.6	20.8	1.9	187	32 51	76.0	20.8
	0.875													
	0.6	All 0.875 in. and 0.6 in. diameter bars were white												
V.980	1.6	48.5	0.47	19.4	47.2	0.59	19.0	22.4	20.2	2.2	178	51 33	54.8	
	1.2	48.1	0.48	20.8	51.4	0.88	20.8	24.0	20.2	2.0	184	75 110	62.0	21.3
	0.875	64.2	0.38	22.2	55.7	0.51	21.8	25.4	19.1	2.5	204		56.4	
	0.6	All 0.6 in. diameter bars were white												
V.895	1.6	61.6	0.52	22.0	63.2	0.63	21.6	28.8	23.8	2.1	213	78 62	71.6	
	1.2	70.2	1.03	23.4	69.6	0.95	23.4	30.6	24.1	2.3	230	55 59	66.0	23.6
	0.875	73.4	0.44	24.9	63.2	0.29	25.0	35.2	24.0	2.1	249	109>120	72.4	
	0.6	77.6	0.36	21.9	80.2	0.36	22.8	34.8	21.4	2.2	272		70.0	
W.3	1.6	65.4	0.33	22.1	69.4	0.45	21.4	37.2	22.8	1.8	258	78 55	74.8	
	1.2	72.9	0.50	23.3	77.8	0.70	22.4	38.0	22.1	1.9	272	100 100	75.2	23.5
	0.875	73.8	0.26	24.0	79.2	0.32	22.1	38.2	22.8	1.9	290	106>120	67.2	
	0.6	77.0	0.18	24.7	80.8	0.23	23.3	38.6	23.4	2.0	313		93.6	
W.30	1.6	68.4	0.42	22.1	73.8	0.58	22.1	34.2	24.2	2.0	262	110	—	
	1.2	71.9	0.54	22.8	64.0	0.42	23.1	37.8	23.4	1.9	271	55 73	66.4	23.8
	0.875	82.7	0.37	26.0	73.2	0.28	23.1	38.0	24.4	2.2	290	56 72	78.2	
	0.6	93.6	0.37	24.3	90.0	0.28	23.9	36.6*	23.4	2.6	307		84.0	

* Fracture showed inverse chill.

consisting of quasi-flake graphite and a few hypereutectic graphite nodules in a matrix of about 60 per cent. ferrite and 40 per cent. pearlite in the case of the 1.2 in. bars. The structures of typical 1.2 in. bars of these two single-treated materials are illustrated in Figs. 5 and 6. Material V.895 was double-treated and had a well developed nodular graphite structure in a mixed pearlitic and ferritic matrix. The micro-structures of the 1.6, 1.2, 0.875, and 0.6-in. bars of this double-treated melt, V.895, are illustrated in Figs. 7, 8, 9, and 10 respectively. The materials W.3 and W.30 were both double-treated nodular irons of lower silicon content. to which 2.0 and 1.5 per cent. copper respectively had been added. The micro-structures of typical 1.2-in. bars from W.3 and W.30 are illustrated in Figs. 11 and 12 respectively. There was some

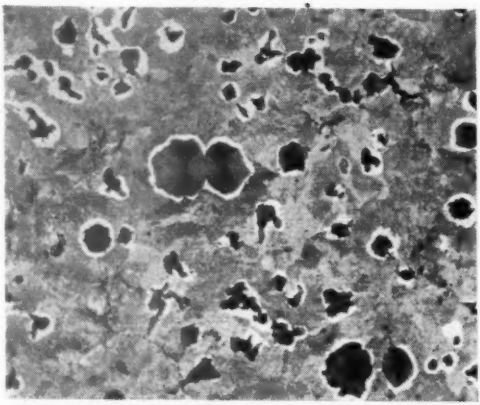


FIG. 12.—GENERAL STRUCTURE OF 1.2-IN. BAR, W.30. ETCHED IN PICRIC ACID. 100 ×.

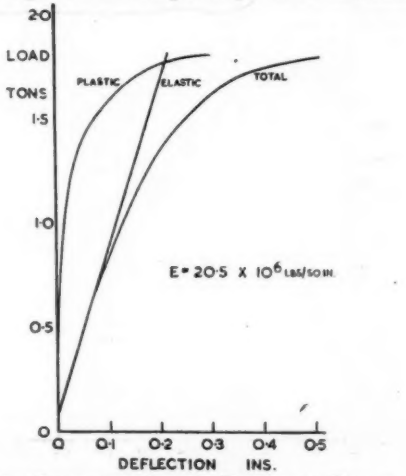


FIG. 13.—TRANSVERSE SET AND DEFLECTION CURVES FOR BAR 1.2 IN. DIA. V.835.

Nodular Cast Irons

quasi-flake graphite in W.3, particularly in the 1.6-in. and 1.2-in. bars, but W.30 was almost entirely nodular in all sections. The matrices of both these irons were almost entirely pearlitic, the amount of ferrite decreasing with decreasing section size.

The mechanical test results, covering transverse on as-cast and machined bars, and tensile, Brinell hardness, impact and compression tests on each size of bar, are given in Table IV. The torsional properties, damping capacity, electrical resistivity and coefficient of thermal expansion results are summarised in Table V. The fatigue results are presented in Tables VII and VIII, and the electrical resistivity and coefficients of expansion again in detail in Tables X and XI respectively.

At appropriate points, the properties of the nodular irons will be compared with those of flake graphite irons, of which details will be given in each particular context.

Transverse

The transverse bars were tested on standard spans in the as-cast condition and after skin machining. A permanent-set and deflection test was carried out on a separate bar of each diameter. In such a test a small load is applied to the bar, and the dial gauge which is used to measure deflections is set to zero. An increment of load is applied and the total deflection measured. This load is then removed until only the original nominal load remains. The deflection which remains represents the permanent set in the bar, and the difference between this and the total is the elastic deflection. This cycle of loading and unloading is repeated at successively increasing loads up to fracture, and from the measurements made a graph of total, permanent, and elastic deflection may be drawn, *e.g.*, Fig. 13.

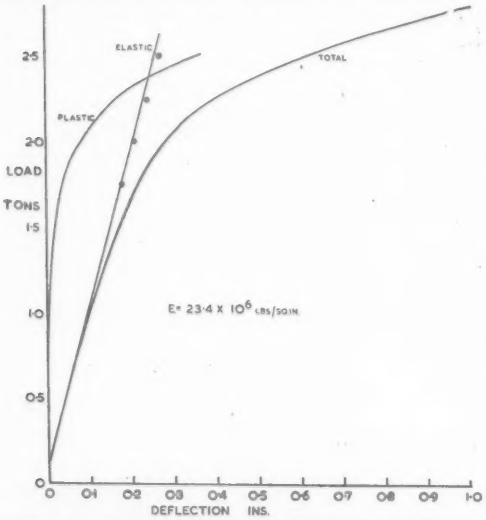


FIG. 14.—TRANSVERSE SET AND DEFLECTION CURVES FOR 1.2 IN. DIA. BAR V.895.

A value for the modulus of elasticity is derived from the slope of the elastic line, which is a straight line drawn through the points representing the elastic deflection at the lower stresses. It is generally found that at loads near the breaking load the elastic deflection points lie a little to the right of the elastic line. This is true of flake and nodular graphite cast irons. The transverse results are given in Table IV and typical set and deflection graphs of a single and a double-treated nodular iron are illustrated in Figs. 13 and 14 for materials V.835 and V.895 respectively.

(To be continued.)

Institute Elects New Members

SECOND LIST (*Continued from page* 13)

As Members

I. Morris, metallurgist, Glacier Metal, Limited, Alperton; W. Spruce, works manager, Wilmer Lea Foundries, Limited, Bow, London; R. Taylor, works manager, Albert Taylor & Sons (Valves), Limited, Huddersfield.

As Associate Members

S. Atkinson, service department, Richards (Leicester), Limited; I. J. Birch, laboratory assistant, Bristol Aeroplane Company; J. Greef, foundry foreman, Rowe Jewell & Company, Limited, Johannesburg; K. Hounslow, technical representative, Reunert & Lenz, Limited, Johannesburg; A. Johnson, foundry foreman, Cooper Roller Bearings Company, Limited, King's Lynn; F. E. Mundoe, foreman, Cochranes (Middlesbro') Foundry, Limited; F. Roscher, foundry foreman, Rowe Jewell & Company, Limited, Johannesburg; C. A. Russell, foreman and junior director, Clensmore Foundry Company (Kidderminster), Limited.

As Associate (over 21)

L. Park, moulder, Head, Wrightson & Company, Limited, Stockton-on-Tees.

As Associates (under 21)

F. E. Cowper, foundry apprentice, Modern Foundries, Limited, Halifax; E. Holder, foundry apprentice, Modern Foundries, Limited, Halifax; F. Sutcliffe, foundry apprentice, Modern Foundries, Limited, Halifax.

THIRD LIST

As Subscribing Firm Member

Clarke, Chapman & Company, Limited, Victoria Works, Gateshead, 8 (representative, J. Howey).

As Associates (over 21)

T. Tate, loam moulder, Clarke, Chapman & Company, Limited; B. Wilson, Victor Products (Wallsend), Limited.

Institute of British Foundrymen—London Branch Discussion

Foundry Production Control

Relations between Planning, Craftsmanship and Incentives

By A. K. Jeffrey and W. A. Turner

A meeting of the London Branch of the Institute was held in the Waldorf Hotel, Aldwych, London, W.C.2, on March 31, 1948. Mr. P. H. Wilson, the President of the Institute, was welcomed to the meeting, and was invited to take the chair during the early part of the proceedings.

The BRANCH-PRESIDENT (Mr. E. M. Currie), offering a welcome to the President, regretted that illness had prevented his attending the Annual Social Event of the premier Branch of the Institute in December last, and expressed the general pleasure that his normal health had been restored.

The NATIONAL PRESIDENT said that at the headquarters of the Institute they were very proud of the London Branch. It was true, as the Branch-President had said, that it was the premier Branch, in the number of members, and it also derived great strength from the enthusiasm of its members, which latter was perhaps of even greater importance than numbers. The Branch was more than 600 strong; it covered a very large area, including London and the home counties, and counties north and south, and its work was followed with very great interest.

The London Branch had been affected particularly by the 1914-18 war, but, due to the enthusiasm of staunch members, its activities were kept alive. Then in 1920 the Branch was fortunate in appointing Mr. V. C. Faulkner as Hon. Secretary, and the records showed that it had been put on to a very sound basis. Mr. Faulkner had served as President of the Institute in 1926. Later he had served again as the Branch Secretary. It was to men of his calibre—and there had been many such in the Branch—that it owed the very high position it occupied to-day in the Institute.

There was a larger percentage of full Members in the London Branch, he believed, than in most or any of the other Branches; there were more full Members than Associate Members in London. In quite a number of Branches, on the other hand, there was a very high percentage of Associate Members. If that indicated that a large number of men on the foundry floor were taking a keen interest in the technique of founding, it should be encouraged. But he urged that, for the benefit of the members and of the Institute generally, Associate Members who were qualified should take advantage of the opportunity to become full Members.

Bearing in mind the remarks that one heard from time to time concerning the difficulties of recruitment into the foundry industry, the President said he would like to see a greater interest in the Students grade; all Branches should encourage the younger men coming into the industry, particularly at the present time. Quite a number of schemes were in being for training and education, and the Institute would be in a position in the future to take an even greater interest in that aspect of its work.

The Paper on "Foundry Production Control," by Mr. A. K. Jeffrey and Mr. W. A. Turner (of Messrs. W. A. Turner, Jeffrey & Company) was then presented by Mr. Turner. (This Paper was printed in the JOURNAL, June 3 and 24, 1948.)

DISCUSSION

The BRANCH-PRESIDENT (Mr. E. M. Currie), commenting on the great interest of the Paper, said that no doubt when they had been able to study the charts in detail they would all realise the immense amount of work contained within them. It was not merely a question of putting this or that type of equipment into its right place in relation to all the other pieces of equipment, or of ensuring that material flow lines were all in the right directions and followed the shortest possible routes. Planned production particularly implied that the various responsibilities and duties were properly understood and properly carried out by each man to the full limit of understanding. No amount of new materials and equipment, ideas or inventions, were worth a tinker's cuss unless the employer and the employed approached the use of that equipment, with the one and only vital consideration (at any rate in these days of our national history), of increasing the output of essential goods at a lower cost and for making more than was formerly made out of the same amount of human energy. If both sides could benefit in this way the plant installed would work successfully and economically, but if there were any trace of antagonism on the part of the men, then the plant was doomed to failure. Therefore, when installing new plant, management must accept the full responsibility of ensuring that the men thoroughly understood their exact position in relation to it, and of training the personnel properly and fully in its use. He had seen too many excellent schemes fail through want of a proper understanding and full appreciation of this single and vital truth.

MR. V. C. FAULKNER (Past President of the Institute) assured the Authors that more foundries had adopted colour schemes than had been suggested in the Paper. He was not at all satisfied with one of those which he had seen, however, because the colour had thrown into relief the dust accumulations on the walls. Therefore he urged that, prior to any attempt to use colour in foundries, the walls should be made smooth in order that they should not serve as dust traps. He regarded that as being much more important than the actual colouring of the walls.

MR. TURNER said that reference was made in the Paper to one foundry on the North-East coast where,

Foundry Production Control—Discussion

he had heard, a scientifically devised colour scheme was in use. But in his remarks on "good housekeeping" the idea was implicit that the foundry should be kept reasonably clean and that every attempt should be made, when laying out a foundry, to render that job as easy as possible. One could appreciate that Mr. Faulkner's comment was entirely justified if the necessary precautions were not taken against dust accumulation.

Wage Incentives

MR. HARRISON, recalling a statement in the Paper that most of the wage incentives that could be applied in the foundry would be acceptable to the Production Control except straight piece work, asked if Mr. Turner could be a little more explicit and would indicate why straight piece work was not acceptable.

MR. TURNER replied that straight piece work schemes did not usually give a square deal to both worker and employer, although, of course, much depended on how they were applied. To explain the matter in detail would involve a great deal of discussion.

MR. B. LEVY suggested that the Authors had somewhat glossed over the experimental work regarding pattern equipment and method of moulding which must precede the installation of any production scheme in the foundry. It was noticeable that in one of the charts the ordering of patterns was fairly low down in the list of materials to be obtained and things to be done. If one were considering the mass production of castings it seemed that pattern considerations and the experimental work involved should be given very close attention at the beginning of the installation of a scheme. He invited the Authors to expand their remarks on that aspect, particularly the early ordering of patterns and pattern equipment.

MR. JEFFREY agreed that undoubtedly a lot of experimental work would have to be carried out before the production patterns were put into the foundry. A point which had not been made, particularly in the Paper, was that that experimental work would be carried out, not in the production foundry, but in some special section set aside for it; it would cause a good deal of confusion in the production foundry if any attempt were made to carry out any experimental work there. Before the production order was arranged the experimental work would be virtually completed.

MR. MORGAN, emphasising the importance of pattern making in relation to production in the foundry, said that if one had a large patternshop the problem was not so worrying; but if there were only a few pattern makers and patterns had to be made for small quantities of castings, one would soon find that the machines were waiting for patterns, whilst the pattern shop was overcrowded.

One of the disadvantages of piece-work schemes was that the piece-work prices were fixed by rule-of-thumb methods, by guesswork and by comparisons with previous jobs. Therefore, in respect of two particular jobs which were identical in shape and in regard to foundry procedure, no two people would arrive at prices which would earn exactly the same amount of bonus in each case. If a job were split into its elements it should be impossible for one operator to make more money than another unless he were working faster and were more agile in his work.

Asking the Authors to make a little more explicit the remark in the Paper that 25 per cent. of the machine time was allowed for pattern changing, Mr. Morgan said he found it easier to split the matter into its elements and to make a time study of it. If that were done an operator could even earn bonus in removing and replacing pattern plates.

Expressing dislike of the term "rate fixer" he said that rate fixing in conjunction with time study should not be tolerated, as it was useless in modern industry; there must be time study, and the man responsible in the shop was called the "time study observer" and not the "rate-fixer." The time study observer should be able to pick a job to pieces, find out which operations were unnecessary, formulate the necessary operations, and quote standard times.

Commenting on the amount of paper work that could be involved in time study schemes, Mr. Morgan said that some of the charts exhibited by the Authors had indicated that it could reach enormous proportions. There must be a happy medium in the drawing up of new systems; one must be very careful about the amount of paper work, because it could become overwhelming and involve a considerable increase in the number of personnel which had to be employed to deal with it.

MR. JEFFREY, dealing with the allowance of 25 per cent. of machine time for pattern plate changes, pointed out that the chart referred to was prepared in connection with equipment selection and plant lay-out in the first place, and for that reason the whole of the machine capacity was averaged out and an allowance of 25 per cent. was made for pattern plate changes in considering the capacity. From the production point of view, of course, he agreed entirely with Mr. Morgan that the actual changing of pattern plates should be time studied, and it could then be part of the operators' work and could be rated on a sound standard basis.

Suiting the Job to the Labour Available

MR. W. F. SIEVEWRIGHT said the planning of production on the lines discussed in the Paper resulted in there being employed in a foundry a very small number of skilled men and a very large proportion of unskilled men. The tendency following from that, so far as he could see, was to debase the standard of labour; and he did not think the money incentive was sufficient to balance against that. A man did his best work when he derived satisfaction and happiness from it, whereas if men were brought down to the level of machine minders and feeders they lost a sense of satisfaction in their work. He asked if the Authors had any thoughts or experience on that problem.

MR. TURNER said the question raised a number of considerations. We were considering increased efficiency and output, and production control. There was no doubt that there was a shortage of skilled

labour, and we could not give skilled jobs to unskilled men. If an unskilled man were to be able to work at the highest possible efficiency—and one bore in mind the nature of the work and the man's attitude towards it—the job had to be made as easy as possible. If a man had the capacity to become a skilled man it was worthwhile picking him out and training him.

But Mr. Turner believed the contents of the pay packet on Friday evening presented a greater incentive than Mr. Sievewright would have us believe. It was necessary to break down every operation or element of work, make it as simple as it could possibly be, and arrange that it was performed as many times as possible per hour or per day, when dealing with unskilled men.

MR. J. N. BURNS, commenting on the suggestion that the financial incentive was not sufficient for the men today, said the whole trend of the labour spirit contradicted that; it seemed to him that the tendency of labour today was away from the skilled jobs to the simple jobs. He had made efforts to give men greater satisfaction in their work by changing their jobs from time to time; but they were not interested in changing, and were only interested in a job they could do easily and which would yield the most pay. He believed that 90 per cent. of the labour force in this country were more interested in what they could get than in the job they were doing.

Thus, he believed the Authors of the Paper were quite right to break down a job to its elements and to make them as simple as possible, in order to get labour to perform efficiently the necessary functions.

Production in "Captive" Foundries

MR. WHITELEY, speaking as one of long experience in a very large foundry for many years, said he had winced when he had heard the reference by the Authors to the Renault factory in France. Having had some experience of that foundry he said it was hardly fair to compare it with the general foundries in this country; the Renault factory made castings only for the company's own products, and if that foundry had a bad year it did not make much difference. He agreed that their methods were extremely good, better than most of our methods, and their costs were comparatively low; but, bearing in mind that they made a certain range of castings, which they had been making for the past 15 or 20 years, it was not surprising that they could come down to production control and planning and could bring down costs to below those of general foundries, which had to meet all sorts of requirements.

On the question of liaison between the foundry and the buyers or customers who required the castings, he said the time would come when we should have to give a little better service than was being given today. For the time being we were living in a sellers' market; but it was most important that for the future ready information should be given to all enquirers about deliveries, which we probably scorned to do these days because delivery times were so long.

Speaking of apprentices, with whom he had had much to do in foundries both in this country and on the Continent, he said that in foundries of any size it was most important that the young men should go through the paper work which the Authors had described; that side of their training was as important as was their academic training in the laboratory and their practical training in the foundry.

Finally, Mr. Whiteley asked on what tonnage of production the Authors could put into operation a programme of planning such as had been put forward, and what would be the costs of overheads.

MR. TURNER replied that his own experience of the Rénault foundry was of very short duration. One could not fail to be impressed, however, not only by their production methods and the results achieved thereby, but also by the fact that nobody seemed to be hurrying or needed to hurry; everything was done to make the job easier for the moulder, and they certainly did get high production.

Obviously he was not dealing, in his comparison, with the jobbing foundries, even those which were laid out for large-scale production. It was related to the "captive" foundries, such as the automobile foundries which made castings for their own factories or works. For the size of box he had seen produced at the Rénault foundry at the rate of 240 half-moulds per hour per machine he believed the maximum production one could expect in an English "captive" foundry would be between 100 and 120, or possibly 140. At the Rénault works they ganged up and used more labour, but the capital tied up in the equipment was used to the best advantage; the machines were in operation throughout the whole of the time. There were double gangs on the machines; as soon as a man finished making a mould, another man was on the machine to make another. A very high order of production planning was required for that.

Service to Customers

One could not but agree with Mr. Whiteley about the importance of giving information to customers concerning progress. The customers must be advised of any hold-ups; it was far better from the psychological point of view to advise him that a job would be late than to leave it to him to ask why it was late. The link between the progress and the sales departments was important. The sales department would want to know what delays there would be, and why, and it was up to the sales department to give the customer the true date of delivery.

He did not run or own a foundry, but the costs of office control and routine could be assessed and estimated just as accurately as could production in the foundry. He suggested that any foundry producing more than about 10 tons per week of iron or yellow metal castings would be in a position to apply, not a large scale of production control, but some system which could be rocognised as production control. Despite the initial cost and despite the paper work, it was still a worth-while measure, but it must be very carefully designed. Each foundry

Foundry Production Control—Discussion

must have its own production control and paper-work system made for it; such systems coud not be ready made.

MR. A. E. WIZZARD asked whether a standard text book were available on the problems of production planning, for it would be extremely interesting to study the various phases. It was interesting also to contemplate the effect of planned production on the craftsmen, and the effect of mass production on the craftsmen, the breaking down of a complicated job to its elements in order to allow dilutees into the craft, so that the craft could be maintained as an economic proposition. Speaking of the production of a statue, such as that of Franklin D. Roosevelt, he did not know what some artists would say to the application of time and motion studies to work of that nature!

Effect of Production Planning on Craftsmen

MR. E. J. GROOM said the question as to the effect of production planning on craftsmen had to be answered, not only from the point of view of the survival of craftsmanship, but also of the continued development of planning. Whereas there were some who were rather concerned about the effects of planning on the art and the craft, Mr. Groom wanted to know what would happen a few years hence, when our workers would be diluted by a large number of those from distant parts of the world. Planning was of the utmost value in dealing with labour of that type; indeed, it was essential. In America, much of the labour was of appallingly low grade. He asked what studies had been made in countries other than Britain on the effects of planning and the effects of changing labour conditions on the progress of planning, to guide members as to the ultimate effects of planning on the foundries of this country.

MR. TURNER said one did not expect, of course, to see mechanised production, on the scale on which we know it in some of the highly mechanised automobile foundries, for instance, installed in some of our jobbing factories; but all planning was naturally based on past experience.

He had a great feeling for craftsmanship; but he felt we must decide whether we were going to have the finest workmanship the world could produce, irrespective of cost and quantity, or whether we were going to have quantity, which was being demanded nowadays. If we wanted quantity we must make provision to meet it, and the type of provision we should have to make was that which he and Mr. Jeffrey had tried to outline. Quantity was being demanded, and manufacturers would not be satisfied until they got it; therefore, the foundries must give it to them.

As to the effect of production planning on skilled labour, surely there would always be a demand for skilled labour; he believed that demand would remain unfilled for many years, despite all our training schemes.

Replying to Mr. Wizzard's question concerning works of reference, he said Mr. Jeffrey and himself had consulted the work of 25 very eminent exponents of the subject for the purposes of the Paper; he would be prepared to give Mr. Wizzard a list of those 25, and probably another 25.

Replying to Mr. Groom, he said he had not read any specific analysis of the effect of mechanisation on labour. The problem had been rather the other way round, that the type of labour that had been available and the type of market to be supplied had demanded mechanisation; only low grade labour had been available, in the main. There had been some very highly skilled and some very unskilled workers coming from Italy; from other parts of Europe the workers employed seemed to be of the unskilled type. If they were to be employed, it was essential to break the jobs down and to make them as simple as possible, so that as little intelligence as possible was needed, because the intelligence was not there. If a man were fit to be trained, he should be trained; if he had not the intelligence to become skilled, why bother to train him?

MR. J. N. BURNS, proposing the thanks of the Branch to the Authors for their Paper, said that from his experience of planning it did grow rather like a snowball. But he felt we in this country must strike the happy medium between the old British standard and the American standard. In the first book that he had read on management and control it was stated that the British had so much paper system that they had not time to do the work, and that the Americans had so much work that they had not time for the paper system.

He believed that in the average foundry there were more moulds and castings lost through lack of attention to proper detailed technical control than possibly the Authors had indicated in the Paper, and he suggested that they would do well to emphasise that more. Again, there was the question of the patternmaker co-operating with the machine moulder and core maker, so that ultimately the combined experience would benefit the whole foundry. The maintenance man could establish standards of maintenance. Such points were well worth re-opening in a second Paper.

As to the effect of planning, he assured the meeting that it would do nothing but good. The critics of Arkwright had foreseen the supposed dangers of the introduction of automatic machinery in the cotton and in other industries; but he believed that to-day there were more skilled craftsmen per capita than ever there were formerly. By breaking down the various functions into the lowest common denominator, they would be understood quickly, and we should have more skilled labour; when the men had had experience of a number of functions they would have achieved within three or four years what the average English apprentice had formerly achieved in seven or eight years. No doubt the application of planning to our foundries would bring about tremendous improvement; we must admit that in some respects they compared unfavourably with almost any other industry in the country. In a final tribute to the Authors, he said they must have devoted many weeks of very hard work to have combined information on so many aspects in their Paper, and he expressed appreciation and gratitude. He hoped the Paper would open up another field of interest for the Institute.

MR. G. C. PIERCE (Past-Branch-President), seconding the vote of thanks, commented on the problem of colour schemes in foundries. Having seen attempts at colouring in departments which were not foundries, he said he liked the idea very much; but he urged that, before we began applying colours in foundries, we should first have them white!

The vote of thanks was carried with acclamation.

MR. TURNER, responding, said that perhaps the Authors had included in the Paper more than could reasonably be digested in the course of one meeting; but they had achieved their purpose in securing comments and suggestions; they had felt that it was only by including that amount of material that they could secure the number of questions they had wanted. He expressed their thanks for the co-operation of those who had taken part in the discussion.

A Mechanisation Film

Last Thursday the Technical Press were given a preview of a series of colour films on the application of mechanisation to industry, which are to be shown at the Mechanical Handling Exhibition to be held at Olympia next week. The third section covers the winning of the ore, the smelting process, cupola operation, foundry sand preparation, and casting. This is a composite film, and includes shots taken in a North London foundry making gas cookers, a magnesium foundry in the Midlands, and a motor-vehicle concern. Mr. T. Hammersley, of the Marco Conveyor Company, asked for the writer's views as to how it would be received by the industry. He pointed out that there was so much material to choose from and selection had been difficult. The film is excellent so long as it is kept in its present sequence, that is, in company with shots in power houses, gasworks, breweries and so forth. The object of the film is to show how British industry has applied mechanisation, and by having so many applications shown, one receives new ideas for the solution of one's own problems. Some industries seem to have standardised on the emptying of railway trucks by running them in cages and then rotating the cage. Whilst this has been applied to foundry practice, instances are still rare. The mechanisation for breweries and banana handling is quite different from that to be seen in foundries. The mechanisation of foundries is tending to become "much of a muchness," and a study of the film as a whole should help to inculcate new ideas. The nomenclature used in conjunction with the sheet rolling section needs revision.

MR. D. C. G. LEES, Editor of "Metal Treatment" and a member of the Editorial Department of THE FOUNDRY TRADE JOURNAL, has been appointed metallurgist to the Aluminium Development Association. A graduate of Cambridge University, Mr. Lees was for six years with the British Non-Ferrous Metals Research Association. He became Associate Editor of "Metal Treatment" in 1946 and Editor last year; he takes up the new appointment in September next.

House Organs

Malleable Iron Facts No. 31. Published by the [American] Malleable Founders' Society, Union Commerce Building, Cleveland, Ohio.

This bulletin correlates the world's largest locomotives with the malleable castings which have been used in their construction. The cover showing the "Virginian" is particularly striking.

"Broomwade" News Bulletin, Vol. 11, No. 3.

Among items of diverse interest, this issue contains an illustrated note on the use of air-operated wire brushes. It is put forward that there is danger in the adaptation of a wire-brush fitment to a tool designed for use with abrasive wheels because the safe running speeds of grinding wheels are very much higher than those of rotary wire brushes. Special tools running at the correct speed should be used in conjunction with wire-brush attachments.

S. & W. Magazine for July. Published by Smith & Wellstood, Limited, Bonnybridge, Scotland.

This issue is a special holiday number and has a larger format. It announces the election of Sir Ian F. C. Bolton, Bt., O.B.E., D.L., as chairman of the directorate, since Mr. J. R. Fyfe Smith is retiring from active participation in the affairs of the company. A new managing director has also been appointed. He is Mr. B. W. Payne. The Smith & Wellstood football club has won the Mitchell Trophy by defeating Mitchell Russells by five goals to one.

Publications Received

The First Ten Years. To celebrate the completion of a decade of their establishment on the banks of the Ship Canal, Manchester Oil Refinery, Limited, has issued an attractive 32-page well-illustrated pamphlet (in fact, half the booklet is exclusively devoted to pictures). Amongst the dozens of products made, are core oils from petroleum aromatic resins. This publication is available to our readers on application to the P.R.O. at 10, Dover Street, London, W.1.

Le Ferrovie Italiane Dello Stato Rinascono

This is a really artistic piece of publicity which, by photography, tabular matter, graphs, and letterpress, tells the story of the rebirth of the Italian railways since the war finished. Great credit is due to the railway executives and their staff for the energy they have shown. The designs of the newer rolling stock and the reconstructed bridges show to what excellent ends the currently available materials can be put. As a number of copies of this 48-page booklet have been received at this office, any of our readers who are especially interested in railways can have one, so long as the little stock lasts. Requests should be sent to the Editor.

THE 22ND ANNUAL CONGRESS of the *Association Technique de Fonderie* is to be held in Paris on Friday and Saturday, October 8 and 9, under the presidency of Dr. Ballay.

Obituary

MR. ALEXANDER D. R. KELLY, of William Hamilton & Company, Limited, shipbuilders, of Port Glasgow, died on June 23.

MR. FRANK H. VAUGHAN, chairman and managing director of Vaughan Bros. (Drop Forgings), Limited, Willenhall, died on June 24.

MR. MATTHEW WHYTE, who died recently, was the founder of Matthew Whyte & Sons, engineers and machinery merchants, of Glasgow.

MR. JAMES M'DONALD, for many years with Redpath, Brown & Company, Limited, structural engineers, etc., of Edinburgh, died in hospital on June 27.

MR. OLIVER W. HEATH, who died on June 24 after a long illness, was chief metallurgist of Pattison & Stead, public analysts, of Middlesbrough. He was 57.

MR. JAMES M. RAMSAY, who died on June 22 after a short illness, was managing director of James Ramsay (Glasgow), Limited, boiler and engine repairers.

MR. JAMES ALFRED TOMKINS, who was a director of H. Frost & Company, Limited, manufacturers of pressings, castings, etc., of Walsall, for 50 years, has died.

MR. FREDERICK BOOTH, who had been in the service of the Staveley Coal & Iron Company, Limited, Chesterfield, for 50 years, has died at the age of 69. He was in charge of the company's pipe shop and fettling department.

MR. ROBERT THOMAS HESLOP, a director of the former Dewhurst Engineering Company, Limited, Sheffield, died recently. For the past 15 years he was a representative of Thomas Wragg & Sons (Sheffield), Limited, fireclay miners, etc.

MR. FREDERICK F. GORDON, joint managing director of Spear & Jackson, Limited, steel manufacturers, etc., of Sheffield, and managing director of Edward & William Lucas, Limited, spade and shovel manufacturers, of Dronfield, has died at the age of 61.

Bank's Holding in Richard Thomas & Baldwins

An official of the Bank of England has confirmed rumours that, since March, the Bank has sold 1,070,000 of its shares in Richard Thomas & Baldwins, Limited. The Bank held, in 1938, Richard Thomas shares to the number of 1,500,000; in that year it invested £500,000 in the company by purchasing 6s. 8d. ordinary shares at par. At the time of the original deal finance was required to extend the Ebbw Vale works.

The terms on which the money was available involved the appointment of a control committee. This was set up with Lord Norman (then Mr. Montagu Norman, Governor of the Bank of England) as chairman. This committee was disbanded in 1945, since when the Bank has had no other interest in Richard Thomas & Baldwins except its shareholding.

Chrome Ore and Concentrates Prices

The following selling prices for chrome, which include carriage charges to nearest rail point consumers' works, apply for despatches effected as from July 1. The prices are per ton, ex ship, and, in parentheses, per ton, ex store.

Refractory Grades.—Rhodesian Imperial grade, £9 18s. 6d. (£11 1s.); Transvaal 1st grade (basis 42 per cent.: scale 1s. 6d.), £7 17s. 6d. (£8 19s.); Indian (basis 40 per cent.: scale 1s. 6d.), £9 2s. 6d. (£10 4s.); Philippine, £7 13s. (£8 15s.); Turkish, grade I (basis 43 per cent.: scale 5s.), £11 13s. (£12 15s. 9d.); Turkish, grade II (basis 38 per cent.: scale 5s. up only), £9 18s. 6d. (£11 1s.); Turkish, grade III (basis 35 per cent.: scale 4s. up, 7s. 6d. down), £8 15s. 6d. (£9 18s.); Sierra Leone, £9 12s. 6d. (£10 15s.).

Metallurgical Grades.—Rhodesian Lumpy, £10 (£11 2s.); Baluchistan, £10 17s. 3d. (£11 18s. 9d.); Rhodesian washed concentrates, £10 4s. (£11 9s. 6d.).

Chemical Grades.—Transvaal "A" grade concentrates (basis 48 per cent.: scale 2s. 6d.), £9 12s. (£10 17s.); Transvaal "B" (basis 48 per cent.: scale 2s. 6d.), £9 6s. (£10 11s.); Transvaal "C" (basis 46 per cent.: scale 2s. 6d.), £8 19s. (£10 4s.); Transvaal "D" (basis 44 per cent.: scale 1s. 6d.), £7 16s. (£9 1s.).

Disastrous Effects of Bulk Purchasing

The Earl of Verulam, chairman of Enfield Cables, Limited. is outspoken in his comments on the effects of the bulk purchasing of non-ferrous metals in his statement circulated with the annual report of the company. "His Majesty's Government has," he says, "consistently refused to allow the London Metal Exchange to reopen; to compensate for its absence the Ministry concerned continues to buy non-ferrous metals in bulk in world markets, on behalf of British industry. The outcome of this policy contains all the elements of disaster for this country; the price of copper wire bars on May 14, 1948, was £132 per ton in Britain, while the world price for the same commodity was approximately £122 5s. per ton. This differential has now been in existence for almost a year. Our other competitors, notably Belgium, Holland and the Scandinavian countries, can still send their skilled buyers out to buy at the world price."

Boulton & Paul, Limited

Plans are announced for the acquisition by Anglo-Transvaal Industries (of South Africa), Limited, of a controlling interest in Boulton & Paul, Limited, structural engineers, etc., of Norwich. There is to be an exchange of shares between the South African company and Mr. J. H. Tresfon, chairman and managing director of Boulton & Paul, who will retain his position with the Norwich company and at the same time will become chairman and managing director of Anglo-Transvaal Industries. Mr. S. G. Menell, of the latter company, will become deputy-chairman of Boulton & Paul.

Personal

VISCOUNT PORTAL has rejoined the board of International Combustion, Limited.

SIR HENRY RICHARDSON and MR. R. A. COOKSON have been appointed directors of Goodlass Wall & Lead Industries, Limited, Oxted, Surrey.

MR. H. C. YAFFE, general manager of Darwins, Limited, steel manufacturers, of Sheffield, has been appointed a director of the company.

SIR ANDREW M'CANCE, F.R.S., president of the Iron and Steel Institute, received the honorary degree of Doctor of Laws at Glasgow University on June 23.

MR. E. L. POLLARD has been appointed an additional director of William Goodacre & Sons, Limited, chain testers and engineers, of Victoria Docks, London, E.16.

MR. H. C. MILLS has been appointed an additional director of Doulton & Company, Limited, manufacturers of crucibles, industrial filters, etc., of London and Erith.

MR. G. T. HILLYAR has been elected a director of English China Clays, Limited, and not of English Clays Lovering Pochin & Company, Limited, as stated in our issue of June 24.

MR. JOHN CURRIE, general manager of Blackett, Hutton & Company, Limited, steelfounders and engineers, of Guisborough, Yorks, has been appointed a director of the company.

SIR BASIL GOULDING, MR. R. G. PERRY and MR. J. C. BUDD have resigned from the board of the Imperial Smelting Corporation, Limited, following the recent merger with the Zinc Corporation, Limited.

MR. H. R. HUMPHREYS, formerly of Cammell Laird & Company, Limited, Birkenhead, has been appointed assistant to the general manager, repair works, of Harland & Wolff, Limited, with headquarters at the company's London office.

MR. G. R. WEBSTER, who has resigned his post as works manager of the Britannia Iron & Steel Works, Limited, Bedford, to take up another appointment, has received a presentation in appreciation of his 12 years' service with the company.

MR. EDWARD W. THOMPSON, who has been sole managing director of John Thompson, Limited, engineers, of Wolverhampton, since 1945, has been appointed chairman and managing director of the company. To assist him, MR. J. H. N. THOMPSON and MR. J. WILSON PERRY have been appointed joint managing directors.

Wills

TAILBY, NORMAN, a former director of Alldays & Onions, Limited, foundry and general engineers, etc., of Birmingham £117,514

NIGHTINGALE, THOMAS, late chairman of Armstrong, Stevens & Son, Limited, drop forgers, etc., of Birmingham, Burt Bros., Limited, brassfounders, etc., and Steel Stampings, Limited, Kidderminster, and a director of Sheffield Steel Products, Limited £51,231

KAYSER, C. W., late chairman and managing director of Kayser, Ellison & Company, Limited, steel manufacturers, of Sheffield, chairman of British Acheson Electrodes, Limited, Sheffield, a director of the Woleseley Sheep Shearing Machine Company, Limited, Birmingham, and for many years chairman of the Sheffield Stainless Steel Manufacturers' Association £47,193

Rapier Walking Dragline

The outstanding order of the year was from Stewarts and Lloyds, Limited, for the Rapier W.1400 walking dragline, the largest walking dragline in the world, said Mr. R. R. Stokes, chairman and managing director of Ransomes & Rapier, Limited, Ipswich, at the company's recent summer sales conference. A report on the progress made in the design and construction of the machine up to date was given to the conference. It was stated that it carried a 20 cub. yd. bucket on a boom 282 ft. long and that the completed machine would weigh 1,500 tons. The tub or base was a circular steel structure 48 ft. dia. and 4 ft. deep, carrying cast-steel slewing rack and rails. The revolving superstructure, with boom, bucket and walking gear, would weigh 1,300 tons and was to be carried on a live ring of 120 rollers, each 10 in. dia. by 7½-in. thread. The four main girders for the superstructure were each 14 ft. by 76 ft. long and carried a total load of 1,260 tons.

It was stated that the boom was of all-tubular construction, triangular in cross-section, 282 ft. long, 40 ft. between foot of pins, 40 ft. from lower members to apex, and weighed 85 tons. All the tubes would be supplied by Stewarts and Lloyds, Limited, in high tensile steel of 23 tons per sq. in. yield. The main bottom members at each side would consist of two 16-in. dia. tubes. The bucket would be hoisted on two steel-wire ropes each 6½-in. circumference and the drag would be by two ropes, each 7-in. circumference. The electric equipment, which was being manufactured by the British Thomson-Houston Company, Limited, consisted of two generator sets, each of 1,500 h.p., and 14 motors each continuously rated at 225 h.p.

Ventilation Fan for South America

The most powerful mine ventilation fan in the world is under construction at the Pagefield Ironworks of Walker Bros. (Wigan), Limited. With a maximum capacity of 600,000 cub. ft. of air per min. at 22 in. water gauge, this fan will exceed the output of the world's largest fan, a 200-in. dia. axial-flow ventilator made by Davidson & Company, Limited, Belfast. This four-phase, Walker-Macard, variable-pitch, axial-flow fan has a diameter of 14 ft. and is the biggest ever made by Walker Bros., makers of the ventilation plant for the Mersey Tunnel and also for the Severn Tunnel. The four rotors will weigh 10 tons each. The rotor hubs will be of cast steel and their 12 blades of manganese bronze.

When complete with its 3,000-h.p. electric motor, which is being made by Metropolitan-Vickers Electrical Company, Limited, the fan will weigh 120 tons. The main fan shaft, which is being made by Wm. Park & Company Forgemasters, Limited, Wigan, is nearing completion. Delivery of the fan has been promised for 1949, when it will go to Schwagar colliery, Valparaiso, South America.

THE TELEPHONE NUMBER of Dudley Vale, Limited, contractors' plant merchants, of Buckingham Place, London, S.W.1, is now Victoria 0252.

News in Brief

THE CAPITAL ISSUES COMMITTEE has refused to assent to the project of the Irish Base Metal Corporation, Limited, particulars of the formation of which were published in our issue of June 17 last.

LONG-SERVICE AWARDS have been made to 234 employees of the five Ettingshall branches of John Thompson, Limited, engineers, of Wolverhampton. The recipients had a total of 3,960 years' service.

J. H. FENNER & COMPANY, LIMITED, power-transmission engineers, belting manufacturers, of Cleckheaton, has opened a branch office and warehouse at 86, Bridge Street, Sheffield (telephone: Sheffield 27774).

THE HOFFMANN MANUFACTURING COMPANY, LIMITED, opened on Monday a new branch office at 50, The Wicker, Sheffield, where an emergency stock of ball and roller bearings will be carried. The telephone number is Sheffield 20246.

THE GOVERNMENT has set up an advisory committee of the Association of British Chambers of Commerce to assess individual claims by exporters to be allowed to sell on the home market. Exporters would have to establish that every effort had been made to sell the goods abroad and that there was no hope of doing so.

THE ANNUAL REPORT to March 31 of Darlington & Simpson Rolling Mills, Limited, states that during the year the installation of the new section mill at Darlington was completed and the mill is now in production. Consequent on this and in conformity with the directors' policy of concentrating production, the four mills which operated in the Midlands were closed down and sold.

WALKER BROS., LIMITED, manufacturers of galvanised sheet, structural ironwork, etc., of Walsall, has announced that, as from July 3, work has been discontinued at the company's sheet and rolling mills. It is stated that insufficiency of labour and materials has made it impossible to conduct the department economically. It is reported that some 80 employees will be affected.

PRELIMINARY STEPS to form a Midland Industrial Development Association were taken on June 22 at a conference of more than 20 local authorities, at Wolverhampton, called by the English National Council of Development Associations. A resolution was passed calling on the delegates to bring the proposal before their local authorities and to report back to a meeting on September 9 at Wolverhampton.

VICTOR MOYLE & COMPANY, Hampton Wick, near Kingston-on-Thames, has purchased the manufacturing rights and sales organisation of engineered marine equipment hitherto made by Afco Marine Products, Limited, Luton. This concern has specialised for many years in the manufacture of high-class gunmetal boat fittings. The acquired business will be operated from Kingston under the name of Moyle Marine Products.

THE GENERAL ELECTRIC COMPANY, LIMITED, announces that the balance-sheet and profit and loss account for the year to March 31, usually issued in July, will not this year be available until October, owing to additional work needed to comply with the Companies Act, 1947. Preliminary figures, it is stated, indicate that the directors will be able to recommend the same dividend (10 per cent.) and bonus (7½ per cent.) as for the last seven years, a total of 17½ per cent.

MR. G. R. STRAUSS, Minister of Supply, toured Teesside works and factories on June 23. Among the firms he visited were Head, Wrightson & Company, Limited, Thornaby-on-Tees, and Imeson & Finch, Limited, engineers, of Stockton. Mr. Strauss also visited Darlington & Simpson Rolling Mills, Limited, where he told workers that he had already arranged with the company's chairman, Lord Braintree, to investigate, with the Iron and Steel Board, the hold-up caused by the shortage of steel billets.

A DEMAND TO THE Prime Minister for an immediate reduction in the heavy burden of public administration, in which one-ninth of the whole working population is now engaged, is being made by the National Union of Manufacturers, which states that the country can no longer support this heavy burden of national overhead cost or be deprived of the man-power thus occupied. It demands that public administration shall be reduced to the conditions of austerity in which industry itself is compelled by present circumstances to operate.

THIS YEAR would be a testing period for the export drive, said Mr. Harold Wilson, President of the Board of Trade, addressing a luncheon of the British Export Trade Research Organisation in London last week. During the next 12 months British exports might no longer be limited by production, but by selling methods, and an increasing "choosiness" in foreign markets, he said. Even if we succeeded in removing restrictions and solving production problems, the acute and growing problem of selling goods abroad still faced us. The problem was one of producing not only in the right quantities, but of the right type, the right quality, and the right price. The export salesman was now coming into the front of the picture.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Ash Foundries, 98, Wood Street, Willenhall—£5,000. W. J. and S. D. Harper.

Feron Stove, Oxen House, Torver, Coniston, Lancs—£6,000. G. Constantinesco and R. Rothwell.

Wellwinch Engineering, 6, Broad Street Place, London, E.C.2—£10,000. L. E. Porter and C. P. Black.

Associated Constructional Engineers—£10,000. M. J. Wordley, 118, Old Broad Street, London, E.C.2, subscriber.

Sign & Metal Industries—£30,000. G. C. McEwen, 10, Parkstone Avenue, Emerson Park, Hornchurch, subscriber.

THE MODERN PIG

IF YOU WANT...
clean iron, free from sand, free from sows ...uniform analysis... convenient size...easy handling... specify
STANTON MACHINE CAST PIG IRON

SPECIFICATION

WEIGHT	80-90 lbs.
Length	22 inches
Width	8½ inches
Thickness (at notch 2½ inches).	3¼ inches

Made in our well-known
STANTON, HOLWELL & RIXONS BRANDS

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Increases of Capital

Details of increased capital have been announced by the following companies:—

KINGSTON ENGINEERING COMPANY, LIMITED, Hull, increased by £500, in £1 shares, beyond the registered capital of £1,000.

HUWOOD MINING MACHINERY, LIMITED, Gateshead, increased by £100,000, in £1 shares, beyond the registered capital of £80,000.

KNOWLES FOUNDRY, LIMITED, Willenhall, increased by £5,000, in £1 ordinary shares, beyond the registered capital of £5,000.

TELMA ENGINEERING, LIMITED, Birmingham, increased by £4,000, in £1 ordinary shares, beyond the registered capital of £1,000.

JOHN HUNT (BOLTON), LIMITED, bakery engineers, etc., increased by £12,500, in £1 shares, beyond the registered capital of £7,500.

CRATON, LIMITED, engineers, etc., of Orpington, increased by £5,000 in £1 ordinary shares, beyond the registered capital of £10,000.

D. A. GUNN (ENGINEERING), LIMITED, Acton, London, W.3, increased by £1,100, in £1 ordinary shares, beyond the registered capital of £900.

TASKERS OF ANDOVER (1932), LIMITED, engineers, etc., increased by £5,000, in £1 ordinary shares, beyond the registered capital of £75,000.

NORTH LONDON HEAT TREATMENT, LIMITED, Hendon, London, N.W.4, increased by £4,000, in £1 shares, beyond the registered capital of £1,000.

REFLEX (ENGINEERING & ELECTRICAL), LIMITED, Regent Street, London, W.1, increased by £2,900, in £1 shares, beyond the registered capital of £100.

HIGHAM FOUNDRY & ENGINEERING COMPANY, (HIGHAM-ON-THE-HILL), LIMITED, increased by £500, in £1 shares, beyond the registered capital of £500.

THOMAS POTTER (NEWCASTLE), LIMITED, engineers, etc., of Newcastle-upon-Tyne, increased by £10,000, in £1 shares, beyond the registered capital of £10,000.

S. E. OPPERMAN, LIMITED, engineers, etc., of Boreham Wood, Herts, increased by £70,000, in 2s. ordinary shares, beyond the registered capital of £200,000.

H. LESTON, LIMITED, machinery merchants, etc., of Newman Street, London, W.1, increased by £1,500, in £1 ordinary shares, beyond the registered capital of £500.

S.R.F., LIMITED, manufacturers of agricultural machinery, etc., of Bishop's Stortford, increased by £7,000, in £1 shares, beyond the registered capital of £3,000.

E. A. & H. SANDFORD, LIMITED, engineers, shipwrights, etc., of Gravesend, increased by £35,000, in £1 ordinary shares, beyond the registered capital of £15,000.

JAMES AUSTIN & SONS (DEWSBURY), LIMITED, iron and steel merchants, etc., increased by £20,000, in £1 preference shares, beyond the registered capital of £50,000.

ANDREWS GRAYSON & COMPANY, LIMITED, brassfounders, etc., of Otley, Yorks, increased by £1,000, in £1 ordinary shares, beyond the registered capital of £2,000.

A. & M. SALES (ENGINEERING), LIMITED, Essex Street, Strand, London, W.C.2, increased by £15,000, in £1 ordinary shares, beyond the registered capital of £10,000.

JOHN VOWTEN, LIMITED, engineers, millwrights, etc., of Fenchurch Street, London, E.C.3, increased by £3,000, in £1 ordinary shares, beyond the registered capital of £3,000.

GASEL, LIMITED, mechanical, electrical, gas and general engineers, etc., of Oakengates, Salop, increased by £10,000, in £1 preference shares, beyond the registered capital of £10,000.

S. DODD & SONS, LIMITED, textile engineers, etc., of Oldham, increased by £105,000, in 105,000 4½ per cent. redeemable cumulative preference shares of £1, beyond the registered capital of £85,000.

THOMAS BOLTON & SONS, LIMITED, copper smelters, etc., of Widnes, increased by £600,000, in £1 4½ per cent. second cumulative redeemable preference shares, beyond the registered capital of £800,000.

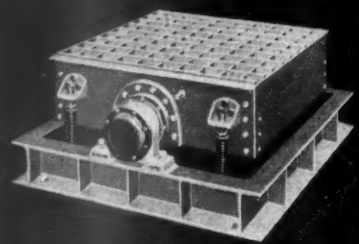
LLOYDS (BURTON), LIMITED, ironfounders, of Burton-on-Trent, increased by £75,000, in £1 ordinary shares, beyond the registered capital of £25,000. F. H. Lloyd & Company, Limited, holds practically all the issued shares.

THOMAS BARCLAY, LIMITED, mechanical, electrical and general engineers, etc., of Bournemouth, increased by £27,000, in 22,000 ordinary and 5,000 10 per cent. redeemable cumulative preference shares of £1 each, beyond the registered capital of £3,000.

LANCASHIRE & CORBY STEEL MANUFACTURING COMPANY, LIMITED, Corby, Northants, increased by £499,000, in £1 shares, beyond the registered capital of £1,000; 249,500 of the new shares are to be issued as fully paid to each of the Lancashire Steel Corporation, Limited, and Stewarts and Lloyds, Limited, in discharge of loans to the extent of £249,500 in each case.

Trafficking in Import Licences

The Import Licensing Department of the Board of Trade has received evidence that import licences granted by the Department are being sold to persons who desire to import goods but who are not in possession of the necessary licences, or whose licences do not cover the quantities they wish to import. It is an offence under the Import, Export and Customs Powers (Defence) Act, 1939, for a person to import goods prohibited by the Import of Goods (Control) Orders, 1940/45, without a licence granted to that person by the Board of Trade. If any cases come to the knowledge of the Board of Trade of direct or indirect traffic in import licences taking place, after the issue of this notice, both parties to the transaction will render themselves liable not only to criminal proceedings and the cancellation of the licences or licences purporting to be transferred, but also, unless the Board is satisfied that no further trafficking will take place, to the refusal of any further import licences.



THE STERLING 30" × 30" LIGHT SHAKE-OUT MACHINE is a suitable model for small or light work. It can be fitted for use with an underground sand conveyor, or on a raised stand with a skip below. Our Catalogue giving details of this and larger models will be sent post free on request.

THE POWER SHAKE-OUT-GRID is a logical and proved mechanical aid to foundry efficiency. It not only empties boxes quicker and reduces wear and tear on them, but also rids boxes and castings of sand more completely and breaks up all lumps in the process. It will reduce the number of men, and cut out the hard labour of shaking out by hand. Sterling Shake-out Machines are right in the front of current practice, are made in sizes to take from 5 cwts. to 5 tons, and for all the normal methods of application.

Sterling

SHAKE-OUT MACHINE

STERLING FOUNDRY SPECIALTIES LTD., BEDFORD, ENGLAND

Company News

(Figures for previous years in brackets.)

International Combustion—Interim dividend of 10% (same).

Greenwood & Batley—Final dividend of 10%, making 15% (same).

J. Stone & Company—Final dividend of 15%, making 25% (same).

H. J. Baldwin & Company—Final dividend of 15%, making 25% (same).

A. E. Jenks & Cattell—Second interim dividend of 2½%, tax free (same).

Morgan Crucible Company—Final dividend of 8¾%, making 12½% (same).

Swan, Hunter & Wigham Richardson—Interim dividend of 4% (same).

Richard Thomas & Baldwins—Final dividend of 10%, making 15% (same).

Briton Ferry Steel Company—Final dividend of 10% (12½%), making 15% (same).

W. & T. Avery—Final dividend of 15% (10% and bonus of 5%), making 20% (same).

Banister, Walton & Company—Final dividend of 20% and bonus of 5%, making 30% (same).

Petrie & McNaught—Net profit to April 30, £21,546 (£14,635); final dividend of 6%, making 10% (same); forward, £48,380 (£40,570).

Gerrard Industries—No final distribution, as paid interims total 25%, making the total distribution the same as last year in compliance with the appeal for voluntary limitation of dividends.

Mason & Burns—Profit for the year to March 31, £28,118 (£13,774); provision for profits tax, £4,000 (£1,000); to income-tax reserve, £11,273 (£5,469); general reserve, £10,514 (£7,500); dividend of 10% (same); forward, £7,380 (£7,800).

Spurling Motor Bodies—Net profit of the group to February 29, £237,668 (£215,341); to tax, £131,341 (£128,998); general reserve, £3,000 (same); contingencies reserve, £20,000 (nil); employees' welfare fund, £2,000 (same); final dividend of 25% (same), making 37½% (35%); written off goodwill, nil (£4,000); forward, £70,773 (£41,009).

Hick, Hargreaves & Company—Trading profit, after taxation, for the year ended March 31, £99,973 (£68,918); interest, £412 (£331); to depreciation, £16,443 (£16,508); net profit, £83,942 (£52,741); to reserve, £40,000 (£20,000); employees' bonus, £8,500 (nil); employees' welfare fund, £3,000 (same); forward, subject to directors' fees, £16,107 (£11,265).

Whitehead Iron & Steel Company—Profit for the year ended March 31, after expenses, directors' fees, etc., but including investment income, £691,087 (£711,876); to taxation, £358,000 (£345,000); depreciation, £40,000 (same); net profit, £292,106 (£325,513); final dividend of 17½%, making 30% (same); to general reserve, £150,000 (£190,000); forward, £73,620 (£60,846).

Scottish Stamping & Engineering Company—Profit for 1947, after depreciation and income tax, £15,514 (£15,891); to directors' fees, £600 (same); preference dividend, £1,650 (£1,612); ordinary dividend of 10% (same); E.P.T. reserve no longer required, £23,713 (nil); written off underwriting commission, nil (£4,000); general reserve, £30,000 (nil); forward, £5,466 (£6,226).

Ruston & Hornsby—Trading profit for the year ended March 31, £997,867 (£527,663); dividends, £121,110 (£100,310); to depreciation, £133,874 (£80,277); debenture interest, £15,750 (same); taxation, £488,699 (£247,297); net profit, £480,654 (£284,649); to replacement of plant, £150,000 (nil); pensions, £25,000 (£15,000); general contingencies reserve, nil (£60,000); general reserve £140,000 (£60,000); dividend of 12½% (same); forward, £140,304 (£100,324).

Darlington & Simpson Rolling Mills—Trading profit for the year ended March 31, £153,769 (£118,414); interest, etc., £464 (£399); to directors' fees, £1,100 (same); directors' salaries and other emoluments, £4,337 (£3,837); interest on loans, £7,800 (£16,944); depreciation, £71,956 (£32,964); income tax, £2,012 (£1,300); balance, £67,028 (£62,668); to preference dividends, £18,033 (£8,580); ordinary dividend of 9% (same); to reserve, £25,000 (£27,469); forward, £36,373 (£31,188).

Thomas Bolton & Sons—Trading profit, dividend, etc., for the year ended March 31, £352,669 (£300,242); to directors' emoluments, £10,779 (£10,733); depreciation, £65,990 (£60,000); interest, £18,422 (£18,760); profits tax, £32,551 (£22,213); debenture redemption sinking fund, £5,209 (£4,985); net profit, £219,718 (£183,551); to U.K. income tax, £87,178 (£104,078); final dividend of 5% and bonus of 2½%, making 10% (same); general reserve, £70,000 (£40,000); forward, £99,345 (£72,422).

Butterley Company—Net profit for 1947, including estimated interim income under the Coal Nationalisation Act, £82,924; provisions no longer required, £90,854; to goodwill written off, £12,500; preference dividend, £11,687 (£8,766 for previous nine-month period); final ordinary dividend of 8½%, making 12% (same for previous period); to reserve, £25,000 (£100,000); forward, £90,798 (£85,007). The report states that during the period under review the collieries were vested in the N.C.B. and, therefore, comparison of profits would be misleading.

Henry Hope & Sons—Profit for the year ended March 27, £243,722 (£76,822); provisions made in previous years no longer required, £45,844 (nil); to estimated cost of approved supplementary pension scheme, £20,000 (nil); reserve against stock in trade and unfinished contracts, £30,000 (nil); reserve against debtors, £11,000 (nil); special depreciation, £50,000 (nil); final dividend on the cumulative preference stock of 5½% per annum, free of tax, making 11% (same); ordinary dividend of 10% (same); to general revenue reserve, £80,000 (£20,000); forward, £112,563 (£63,497).

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203

Raw Material Markets

Iron and Steel

Whereas the selling prices of basic, hematite, and refined irons have been advanced, foundrymen are still receiving their licensed tonnages of No. 3 iron at the quotations which have been in force since the beginning of the year. In their case, the difficulty is, and has been for some time past, to obtain adequate supplies for current needs. Production of this grade cannot be increased until more coke and more native ironstone are available, and in neither case is the outlook encouraging. The high rate of activity in the engineering trade is also reflected in the heavy call for special castings. Thus there is a sustained demand for low- and medium-phosphorus, hematite, and refined irons, which does not appear to have suffered any shrinkage since the advance in prices was announced.

Imports of semi-finished steel from America, until recently the principal overseas source of supply, have shrunk to a very low level. More material is coming in from Belgium and Canada, but these sources of supply are both precarious and costly. Consequently, the pressure for deliveries of British billets, blooms, sheet bars, and slabs is intense, and buyers would be glad to increase their purchases even at the higher prices now ruling. Defective material is also keenly sought, but only small tonnages are available, works having long since disposed of their stocks.

Steelworks are maintaining a high rate of production and there are few complaints about arrears of delivery. For the most part, the mills are keeping well abreast of their commitments. But the clamour for increased allocations has become more insistent. In a wide variety of trades outputs are governed by the amount of steel available, and it is rare indeed to find a user whose requirements are fully satisfied. Apparently the shipbuilders are to be accorded more favourable treatment, but the output of new tonnage for the year is not expected to exceed 1 million tons. There are certain fixed export commitments which will have to be honoured in the ensuing six months, and priority industries at home, such as coal mining, are absorbing heavy tonnages. Sheet and plate mills are assured of capacity working to the end of the year; wagon and locomotive builders have never had such heavy order-books, and tubemakers also have a large volume of work in hand.

Non-ferrous Metals

Zinc closed on a very firm note in New York last week, 14.25 cents being bid for futures, although the current price of the metal was no more than 12 cents. There is, of course, every expectation of a rise and general opinion seems to favour an increase of as much as 3 cents per lb., although at the time of writing no change has been made. Should the rise be as much as that, then the quotation in this country is likely to go to £85 per ton or even higher, for the Ministry of Supply has no allocation scheme as in lead and would be obliged to act promptly. With regard to lead allocation, it is reported that the quotas for the third quarter are much the same as for the second, but whether all this metal will be taken up is a matter for some doubt, as it appears that, in some directions at any rate, the demand is hardly equal to the supply. It must be remembered, of course, that secondary lead is very plentiful and, indeed, in excess. This quality is suitable for certain types of work and, in fact, the use of virgin metal is not permitted for some purposes, so the available tonnage of primary metal is quite sufficient for users' needs. It is doubtful whether in the event of an increase in the virgin price the value of scrap would advance accordingly.

It rather appears as though the price of scrap is reaching its lowest level, for although demand is no better, there is a slightly steadier tendency. The fact is that very little business is passing in secondary metal and in these circumstances it is not easy to check values satisfactorily. Stocks of scrap in the hands of the Ministry would appear to be increasing, at least that is the deduction to be drawn from published details of its holding at May 31. In view of this the reduction of the official list of scrap-metal prices to brass S.A.A. muffled and/or mechanically treated cases at £100; brass broken-down fuse scrap, £93; and zinc alloy die-cast scrap, £70, is somewhat strange. In addition, although the 70/30 scrap is probably about equal to market values, the 60/40 fuse scrap is a long way out, for merchants to-day would probably be prepared to sell extruded brass-rod scrap at something like £20 below the Ministry's figure of £93, ex works.

Non-ferrous Scrap Metal Prices

The Ministry of Supply has announced that, owing to the disposal of stocks of non-ferrous scrap metals, the items in the list previously published, with the exception of those specified below, are no longer available at fixed prices.

The following materials are still available at the prices listed:—Zinc alloy die-cast scrap, £70 per ton, ex works; brass S.A.A. muffled and/or mechanically treated cases, £100 per ton; brass broken-down fuse scrap, 60/40, £93 per ton.

All other items are deleted from the list and any remaining stocks or future arisings of the deleted items will be offered for sale by competitive tender from time to time.

Further Large Order for Simon-Carves

An order worth £1,250,000 for the supply of steam generating plant for the Bunnerong power station in Sydney, Australia, has been received by Simon-Carves, Limited, Cheadle Heath, Stockport.

The company recently received an order from Helsinki Corporation Gasworks for coke-ovens, gas-producer plant and ancillary equipment worth over £650,000.